UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
ECOLOGICAL SERVICES
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2-21-90-F-189

October 23, 1990

To: District Manager, Arizona Strip District, Bureau of Land Management, St. George, Utah

From: Field Supervisor

Subject: Bighole Fence in the Pakoon Spring Allotment - Biological Opinion

This Biological Opinion responds to your memorandum dated June 29, 1990, which requested formal consultation with the Fish and Wildlife Service (FWS) pursuant to Section 7 of the Endangered Species Act of 1973, as amended (Act). The FWS received your request on July 2, 1990. A 14-day extension was granted during consultation to enable receipt of additional information from the Bureau of Land Management (BLM). The action under consultation involves construction of a fence in the Bighole pasture of the Pakoon Springs Allotment and its impacts on the desert tortoise (Gopherus agassizii), a Federally listed threatened species.

This Biological Opinion was prepared using the best project description and on-site biological information available at the time of consultation, including: The Environmental Assessment (EA NO. AZ-010-90-023), dated June 29, 1990; BLM memorandum dated September 6, 1990; Shivwits Proposed Grazing Management Environmental Impact Statement (EIS) (July 1980); and information contained in our files. The Desert Tortoise Habitat Management on the Public Lands: A Rangewide Plan (Rangewide Plan) was used as guidance for determining management objectives for tortoise habitat, especially Rangewide Plan Objectives 3, 4, 5, 7, and 10 (BLM 1988).

BIOLOGICAL OPINION

It is my Biological Opinion that the proposed construction of the Bighole Pasture fence is not likely to jeopardize the continued existence of the Mojave population of the desert tortoise.

BACKGROUND INFORMATION

History of Pakoon Springs Allotment

The Pakoon Springs allotment is located in the Shivwits Resource Area on the Arizona Strip District, approximately 25 miles southeast of Mesquite, Nevada. Elevations range from 1900 feet in the south to 3750 feet on the northern mesas. The allotment is divided into five pastures (Figure 1), although pasture fences have not been functional until this year and cattle have roamed freely within the allotment. The Bighole pasture consists of a large confined valley with deep sandy soils. The vegetation in the Bighole has been altered from its native state by grazing and wildfires, but historically has had the potential to contain the highest perennial production of grasses on the allotment.

Livestock grazing began in the Pakoon Basin in the late 1800s but was limited to areas serviceable by springs located along the Lower Grand Wash, Pakoon Springs, and a few springs along the Nevada border. Large herds of sheep were grazed in the Pakoon area around 1910 for ephemeral forage. Uncontrolled grazing, with numbers of cattle, burros,

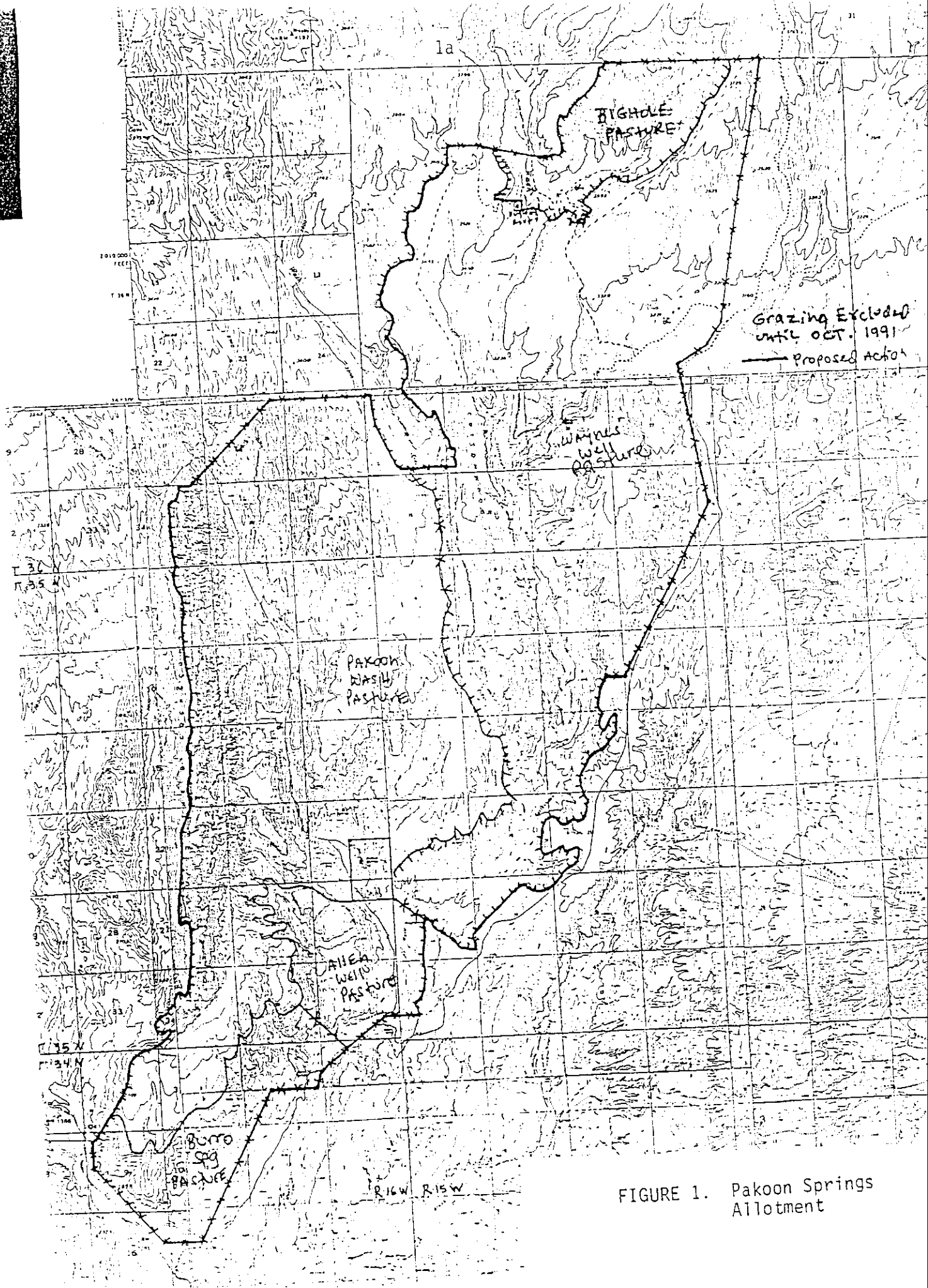

FIGURE 1. Pakoon Springs Allotment

and wild horses reaching 3,000 animal unit months (AUMs), continued until passage of the Taylor Grazing Act in 1934 and adjudication of public lands. On the Arizona Strip, adjudication was based on the ownership or control of water for servicing livestock. Generally, individuals who controlled water were granted the privilege to graze livestock for a 5-mile radius around that water, of which one or more waters constituted an allotment. In the Pakoon Basin, allotment numbers were as follows:

YEAR	ALLOTMENT NUMBERS		BASIS FOR CHANGE
Before adjudication	150 cattle, 100 horses	= 3,000 AUMs	
1936	100 cattle yearlong	= 1,200 AUMs	base rating
1940	94 cattle yearlong	= 1,128 AUMs	original adjudication
1953	108 cattle yearlong	= 1,296 AUMs	additional water
1966	108 cattle yearlong	= 1,296 AUMs	six additional sections
1981	121 cattle yearlong	= 1,452 AUMs	Shivwits Grazing EIS

In 1979-1980, the northern portions of the allotment were severely burned by wildfires, which resulted in replacement of the native mixed desert community with annual grasslands in some parts of the Bighole area. In 1981, the permit was transferred to the current operators. The previous permittee took considerable non-use on a regular basis, averaging 78 cows over a 5-year period. No non-use has been taken on the allotment since 1983.

In July 1980, a grazing decision was issued as a result of the Shivwits Grazing EIS, based on a 1976-1977 range survey. The ten-year grazing permit for Pakoon Springs allotment authorizes 117 cattle and 4 horses on a yearlong basis or 1,394 federal AUMs. The allotment contains 33,968 federal acres which equates to 2.3 cattle yearlong per section. The permittees run a normal cow/calf operation.

In March 1989, the third reading of the pace-frequency trend studies indicated a decline in warm season grasses within the Bighole portion of the allotment. This method uses a 39 centimeter (cm) x 39 cm reference frame during four 50-pace transects. The occurrence of vegetative species within the frame at each pace is recorded, along with ground cover as indicated by litter, bare ground, rock, or vegetation. The result is a 200-plot sample of the key area which is read every three to five years.

Although interior fences existed, pastures in the Pakoon Springs allotment were never maintained. Cattle were generally pushed to the south end of the allotment during winter-spring periods. However, cattle drift continued throughout the year, and areas never received complete rest. Therefore, attempts to keep cattle out of the Bighole area throughout the remainder of the year proved futile.

Discussions to completely remove cattle from the allotment were conducted between BLM and the permittees in February 1990. The permittees protested the action and committed to repair the existing fences in the Burro, Allen, and Pakoon Wash areas to form pastures and contain cattle to the western half of the allotment. The BLM then issued a formal exclusion of livestock from the Bighole area until October 1991. An incremental reduction of the allotment to 65 cattle was also implemented by May 15, 1990, on a temporary basis through the grazing year (March 1, 1991).

This year, livestock have grazed the Burro Spring and Allen Well pastures from approximately January 1 to April 15. Because of the lack of a fence and grazing restrictions placed on the Bighole area, which comprises approximately 10 percent (%) of the allotment, cattle have not been able to use the Wayne's Well pasture. Therefore, cattle have currently been held in the Pakoon Wash pasture since April, which limits use to approximately 50 % of the allotment. Even with these grazing restrictions, cattle have drifted back into the Bighole area. Livestock numbers have been reduced to relieve grazing pressure, but under these restrictions, allotment conditions are being sacrificed in terms of rest, rotation, and deferment of vegetation.

The Pakoon Springs allotment is designated as perennial-ephemeral range. The range inventory of the Pakoon Springs allotment was completed in the early stages of the EIS process and included a 1,018 pound/acre annual allocation based on an average of perennial forage production. Several adjustments were made in the inventory in an attempt to correctly allocate forage in these lower elevation allotments, but finally, all annual allocations were discarded on other allotments. However, written agreements had been previously signed for Pakoon Springs allotment, and the inventoried capacity, including an annual allocation of 147 AUMs, was approved in 1981. Pakoon Springs is the only allotment which provided for an annual allocation based on perennial forage production.

In addition to the annual allocation of 147 AUMs discussed above, the Shivwits Management Framework Plan and Grazing EIS allow an increase or extension of livestock use during a season of high annual production. No ephemeral authorizations, resulting in increased number of livestock above the approved carrying capacity, have been issued yet for Pakoon Springs allotment.

The allotment can contain feral burros that encroach north of the burro protection fence, which also serves as the southern boundary of the allotment. Burros are actively removed to limit distribution outside of the designated burro area.

The BLM divides their grazing allotments into four categories: custodial, maintain, intensive, and less-intensive. The custodial management category is for allotments that are difficult to manage. Maintain category is for those allotments that are currently at or near their potential. The intensive management category is for allotments that have the potential for intensive grazing systems, that have high forage values, or have a majority of the land under public ownership.

Pakoon Springs allotment is managed as a less-intensive management system. Under less-intensive management, an allottee is not required to follow a specified grazing system, but BLM specifies livestock numbers, class of animal, and grazing season. For the Pakoon Springs allotment, the BLM has approved a continuous grazing period without rotation, but limits utilization to 45% of the current year's vegetative growth on key species.

The July 1980 EIS stated that an Allotment Management Plan (AMP) would be prepared within two years following the filing of the final EIS. After the AMP is prepared and implemented, an estimated 15 years would be required to meet the AMP objectives for long-term sustained productivity of livestock forage and watershed and wildlife improvement. The AMP for the Pakoon allotment has not yet been prepared but is expected in 1991, eleven years following the filing of the EIS. Allotments operating without AMPs are to be kept at a maximum average utilization of 45%.

The July 1980 EIS also stated that desert tortoise habitat was to be protected by resting tortoise concentration areas from spring livestock grazing, by providing livestock waters no closer than 1 mile from concentration areas, and if necessary, by fencing washes containing a high concentration of tortoises. Wildlife forage requirements in the EIS were determined cooperatively between BLM and Arizona Game and Fish Department to satisfy the needs of a "reasonable number" of big game animals and did not consider non-game species such as the desert tortoise.

Seven livestock waters exist on the allotment. The largest water, Pakoon Spring, is located on private land and is accessible to livestock from all sides. This water is normally the only dependable source in the western half of the allotment during summer months. The allotment contains approximately 20 miles of allotment boundary fence and approximately 5 miles of interior pasture fence. These interior fences form four pastures on the allotment, but until this year, these pastures have not been functional. The proposed fence would create the Bighole pasture, which would be the fifth pasture in the allotment.

Project Description

The BLM proposes to construct approximately 2/3 mile of pasture and gap fences off the existing Dugway Reservoir waterlot in the Bighole portion of the Pakoon Springs allotment located in T.36 N., R. 15 W., Sections 8, 9, 16 (Figure 2). The fence route follows extremely steep and rocky slopes of adjacent mesas, tying into natural boundaries along the rims. Only hand clearing of the fence route would be allowed where needed. The BLM would provide materials under a Cooperative Agreement, while the permittees would be responsible for the construction.

The proposed action would be required to regulate grazing use in the Bighole area and initiate a rotational grazing system on the allotment. Under the proposed AMP, the Bighole is being designed as a separate pasture with grazing use limited to approximately one month during the late fall-early winter season (October-December) depending on cattle numbers. At least four other pastures are proposed to provide seasonal rotation, rest and deferment of vegetation on the allotment. Information on patterns of use are not yet available.

The BLM has included the following stipulations for the project:

1. Vehicle travel off existing roads would be prohibited with the exception of access down the main drainage of Cottonwood Wash where impacts would be negligible on the highly disturbed gravel and boulder bed (BLM memorandum June 29, 1990).

2. Construction would be prohibited during periods of peak tortoise activity. If tortoises are discovered along the actual route during construction of the project, the applicant would be required to stop work and notify BLM (BLM memorandum June 29, 1990).

3. Fence construction in the Bighole would be contingent upon restrictions limiting grazing use to approximately one month each year between October and December until 1995. Any spring use would require prior approval from the Area Manager (BLM memorandum June 29, 1990).

4. Monitoring data indicate a reduction in livestock numbers is required. A decision will be issued reducing total livestock numbers to 1,118 AUMS or 97 cattle yearlong (BLM memorandum, September 6, 1990).

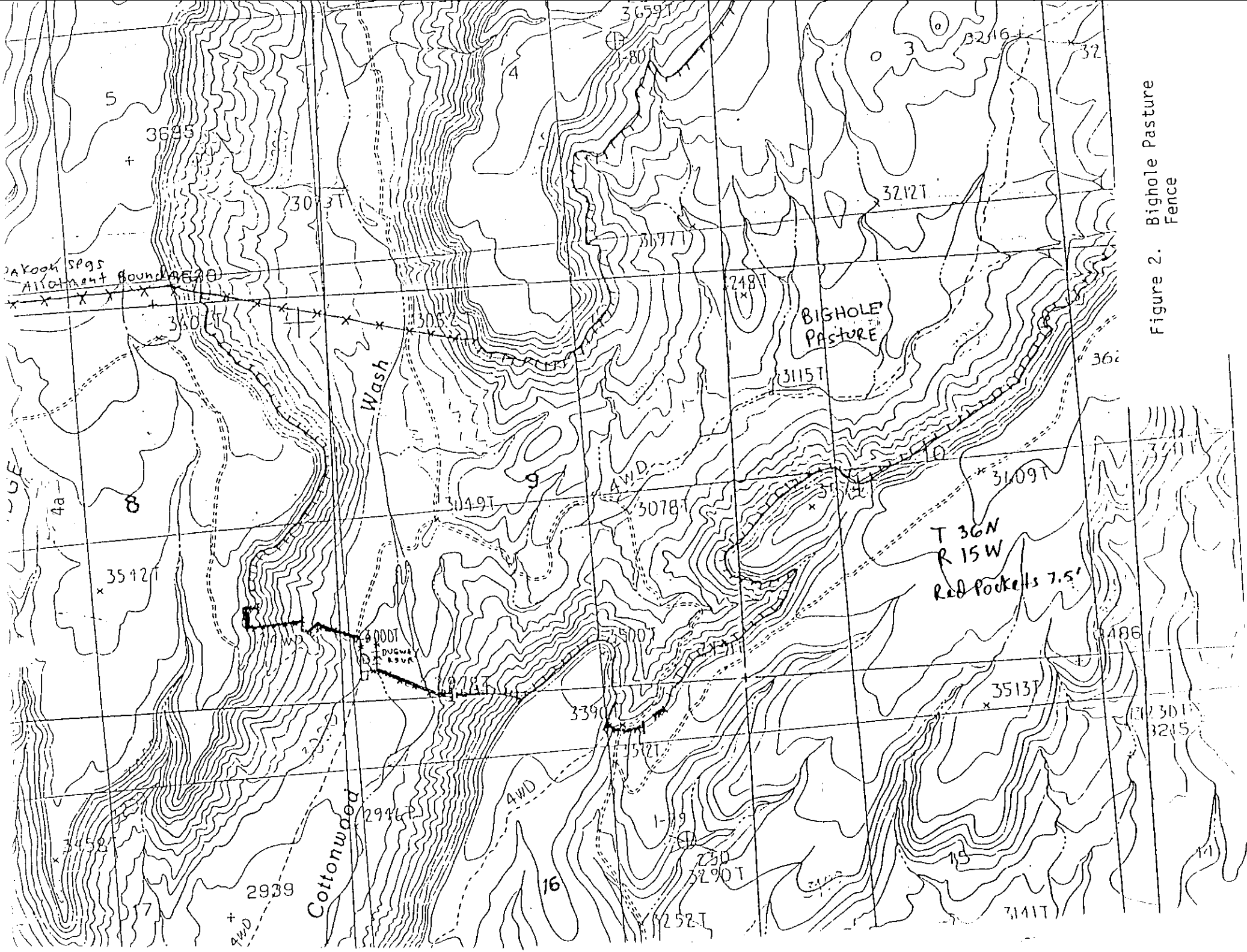

Figure 2. Bighole Pasture Fence

5. A fence to restrict cattle grazing in the Bighole area will be required regardless of an AMP or any type of grazing system. Grazing in the Bighole will be restricted to approximately one month each year between October 1 and December 31 until 1995. Any spring use would require prior approval from the Area Manager (BLM memorandum, September 6, 1990).

6. Along the Cottonwood Wash in the Burro Spring and Allen Well pastures, Indian ricegrass is fairly prevalent among the deep sandy soils. Spring rest is needed for maintenance of these grasses. Grazing in the Burro Spring and Allen Well pastures will be restricted to use between January 1 - February 28 each year. These pastures will be run in common until spring green-up in February, after which rotational deferment will occur each year between these pastures until March 1. Any grazing use beyond these restrictions would be proposed and consulted under the draft AMP (BLM memorandum, September 6, 1990).

Species Description

The Beaver Dam Slope population of the desert tortoise, located in southwestern Washington County, Utah, was Federally listed as a threatened species with 39 square miles of critical habitat on August 20, 1980. Subsequently, the Mojave population of the desert tortoise was listed by emergency rule as endangered on August 4, 1989, and by final rule as threatened on April 2, 1990. The Mojave population includes all desert tortoises north and west of the Colorado River in California, southern Nevada, northwestern Arizona, and southwestern Utah, including the Beaver Dam Slope.

The burrowing habits of tortoises, which vary greatly with their geographic locality (Burge 1978, Luckenbach 1982), represent unique adaptations to the extreme environs they occupy. Burrows function primarily as thermo-regulatory aids and may also serve to aid in water conservation and protection from predators. Shelters ites may be located under bushes, in the banks or beds of washes, in rock outcrops, or in caliche caves.

Desert tortoise growth averages 9 millimeters (mm) per year, with the greatest amount of growth following winters of high precipitation and the resultant increase in production of winter annuals in the spring (Medica et al., 1975). Turner et al. (1987) estimated that sexual maturity is attained at an age of 17-20 years. Egg laying occurs from May through July. Nests are dug in sandy soil and usually resemble undisturbed ground. Females often urinate on the nest before and after filling it (Patterson 1971). Clutch size varies from 2 to 14 eggs (5 to 6 being the mean), with larger females generally having larger clutches (Grant 1936, Ernst and Barbour 1972). Forage must be sufficient to allow females to accumulate energy reserves for egg production (Turner et al. 1986). Tortoises are able to increase egg production in good rainfall years by increasing the number of clutches (Turner et al. 1984). The quality and quantity of food available is also important in clutch success (Mayhew, 1968).

Incubation apparently varies from 90 to 120 days in the wild, with hatching occurring from August to October. Observations by Luckenbach (1982) indicate that hatchlings spend little time on the surface, as they either dig or find an existing burrow and begin dormancy shortly after hatching, ignoring food and water. In some cases, eggs do not hatch in autumn but remain over the winter, with hatchlings emerging in the spring.

Peak tortoise activity usually coincides with the abbreviated period of annual bloom in the spring. Luckenbach (1982) considers this spring bloom to be critically important to tortoise survival and reproduction.

Like livestock, tortoises prefer some plants over others and will go out of their way to consume them even when the plant is in low abundance. Understanding the composition of the desert tortoise diet is important in determining overall health of a population. It is important that tortoises vary their diet because few forage species supply a good balance of nutrients (Urness and McCulloch, 1973).

In southern Nevada, Nagy and Medica (1986) found that tortoises consumed forbs in spring, dried grasses in June (after the forbs dried), and seedlings and green grass sprouts in autumn. They also reported that tortoises consumed none of the 12 species of perennial shrubs and cacti that occurred in the study area.

In Ivanpah Valley, California, tortoises consumed grasses until mid May, followed by annuals and seeds (Turner et al., 1984). In 1981, a dry year, tortoises in Ivanpah Valley consumed cacti much more frequently, particularly after mid-May (Turner et al., 1984). In other studies in southern California, Luckenbach (1982) reported that forbs were the most important tortoise foods, followed by grasses, which he suggested were used only to maintain summer activity. Luckenbach (1982) also reported no observations of desert tortoises feeding on perennials and related this avoidance to the high salt content found in perennial vegetation.

Based on field observations in September, October, November, and January, and on stomach content analyses, Woodbury and Hardy (1948) noted that tortoise diets on the Beaver Dam Slope in Utah consisted mainly of the grasses red brome (Bromus rubens) and bush muhly (Muhlenbergia porteri). In the same general area, Hansen et al. (1976) found that tortoise feces consisted of 64% grasses (red brome), 27% forbs (Erodium cicutarium, Astragalus, and Oxytropsis) and 6% shrubs (Eurotia lanata). The diet observed by Hansen et al. (1976) represents a dietary shift from perennial grasses and annual grasses to a diet of annual grasses and forbs.

When compared to shrubs on a dry weight basis, forbs are nutritionally superior in protein, phosphorus, and digestibility and are lower in fiber and dry matter (Urness and McCulloch, 1973). Forbs are also higher in protein than grasses (Fowler 1977). However, Nagy and Medica (1986) found that while eating forbs in spring, tortoises in southern Nevada did not eat enough food to achieve energy balance. They proposed two explanations: (1) tortoises ate as much as they could but due to the high water content, dry matter intake was inadequate or (2) tortoises did not consume food at their maximum rate, possibly due to potassium levels in the food. Although forbs provide the tortoise with abundant water, excess salts (primarily potassium) that are not excreted result in increased osmotic and ionic concentrations in both urine and plasma (Nagy and Medica, 1986).

In southern California, cacti were a much more important dietary component in late spring and summer than in early spring and occurred more frequently in feces in both spring and summer than did grasses, annuals, perennials (other than cacti), and seeds (Turner et al. 1984). Opuntia spp. is much lower in protein, carbohydrates, fat, and phosphorus than shrubs, forbs, and grasses (Fowler 1977). It is also much lower in energy

(Kilocalories/gram) than shrubs and grasses (Fowler, 1977) and probably serves more importantly as a source of water (Turner et al, 1984). Fowler (1977) reported a water content of 79.4% for Opuntia spp., versus a fiber content of 2.8%.

Geophagy has been reported in desert tortoise feces by Hansen et al. (1976), Luckenbach (1982), and Escue et al. (1990). Escue et al. (1990) also reported consumption of cattle and rabbit bones by desert tortoises. Marlow and Tollestrup (1982) reported that tortoises actively mine and consume soils of high calcium content, and suggested that females may use these soils to replenish body calcium reserves depleted during eggshell development. Luckenbach (1982) suggested that soil in tortoise diets may aid in digestion or serve as territorial or individual markers.

Mortality of desert tortoises may be influenced by a number of natural factors. Predation of tortoise eggs and juveniles by animals such as coyotes, badgers, foxes, and raptors is probably a limiting biotic factor on desert tortoise populations (Luckenbach 1982).

Grazing has been implicated as one of the major impacts to tortoises and their habitat in the Mohave Desert (Johnson 1990). Direct impacts from grazing include trampling (Coffeen 1990), while indirect impacts include loss of plant cover, change in vegetation, and compaction of soils, which are most apparent in livestock watering, bedding, loading, and unloading areas (Berry 1984).

A dietary overlap exists between cattle and tortoises in the eastern Mohave Desert, with both animals preferring annual forbs and grasses in the early spring (Hohman and Ohmart 1980; Sheppard 1982). Sheppard (1982) observed a dietary overlap between cattle and tortoises of 59.9% and stated that the overlap was greatest in drought conditions. Competition between tortoises and cattle occurs when grazing results in the inhibition of growth or reduction in populations of desert tortoises (Wagner 1978).

Grass fires have resulted in tortoise mortality both directly and through habitat destruction (Woodbury and Hardy 1948). Grass fires have increased in the Mohave Desert since the 1970s (Berry (1984). BLM (1989) reported that the Mohave Desert did not historically produce enough vegetation to keep a fire burning more than a few yards. However, the introduction of the prolific non-native annuals provides a flashy fuel source that easily carries fires (BLM 1989).

Recently, an upper respiratory disease syndrome (URDS) has spread through many of the desert tortoise populations in the Mojave Desert, resulting in severe population declines in some areas, including the Beaver Dam Slope on the Arizona Strip District.

Human activity is also a significant cause of tortoise mortality (Luckenbach 1982). Detrimental activities include collecting, vandalism, and release of captive tortoises back into the wild. In addition, the increasing use of off-road vehicles is having a significant effect on tortoise abundance and distribution. Not only may direct mortality result through crushing of tortoises either above ground or in their burrows, but the desert ecosystems have also been degraded as a result of off-road vehicle use (Luckenbach 1982). Growth of annuals and herbaceous perennials may be severely reduced, and the basic energy fixation and transfer systems of the desert can be disrupted or destroyed by vehicular activity.

Estimated population densities of tortoises in the Pakoon Basin ranged from 0 to 50 per square mile. The BLM has placed the allotment in category 3 (0–5 tortoises per square mile), with the exception of 400 acres in the extreme southern portion of the Burro Spring pasture, which is classified as category 1 habitat or high density habitat (>25 tortoises per square mile). Occasional tortoise sightings have occurred within the western half of the allotment, though historical tortoise remains have been found elsewhere (BLM memorandum, June 29, 1990).

EFFECTS OF THE ACTION

In 1980, livestock forage conditions for the Pakoon Springs Allotment were listed as 16,549 acres in fair condition and 8,795 acres in poor condition (BLM 1980). Monitoring for the Pakoon Springs Allotment did not begin until 1982 following the grazing decision.

Trend data displayed in Table 1 of the BLM memorandum dated September 6, 1990, show that warm season grasses (based on key forage species of Indian ricegrass (Oryzopsis hymenoides, big galleta (Hilaria rigida), and sand dropseed (Sporobolus cryptandrus)) have declined from 15.5% in 1982 to 4% in 1989 in the Bighole pasture. In addition, although utilization was to be kept at 45% for this allotment, actual utilization of warm season grasses for the period 1982 to 1989 was 51% (range 10 to 76) on the Big Hole pasture, 51% (range 35 to 62) on the Wayne's Well pasture, and was not measured in Pakoon Wash. A key area and trend plot were established in the Burro Spring pasture after it was fenced this year. No trend plots have been established in Allen Well pasture. Although utilization by livestock is supposed to be determined every year following grazing of the pasture, it has been precluded in some years due to personnel shortages.

Relative occurrence data show that annual grasses far outnumber perennial bunchgrass species in all three pastures. Big Hole pasture contained 2% warm season grasses, 4% cool season grasses, and 48% annual grasses. Ground cover trend (presence of litter) has increased in all key areas except Bighole pasture, which showed a decline of 60% from the initial 1982 reading (BLM memorandum, September 6, 1990). Warm season grasses are most important to desert tortoises in the Mohave Desert, as their growth and bloom coincide with the tortoise's activity period in spring. Warm season grasses are also higher in protein and phosphorus than are cool season grasses (Rosskopf et al. 1982).

Desert tortoise habitat in the Mohave Desert originally consisted of shrubs interspersed with perennial bunchgrasses (Woodbury and Hardy 1948). Although non-native annual grasses were beginning to become established, bunchgrasses still persisted in the early part of this century and comprised a significant portion of the tortoise's diet (Woodbury and Hardy 1948). Bush muhly, formerly a major component of the tortoise's diet, is now scarce (Gould 1973). Bush muhly originally existed in extensive stands on open range lands but now occurs mostly in the protection of shrubs and is seldom locally abundant, as it is highly palatable and well liked by livestock (Gould 1973). Red brome now occurs on ranges where the original grass cover has deteriorated (Humphrey 1960) and in areas that have been overgrazed (Parker 1972). The new vegetative community of annual grasses does not have the same nutritional qualities required by the tortoise for growth and reproduction (Jarchow and May 1989).

Tortoises use the relatively high crude fiber content in perennial grasses to sustain their nutrition after ephemerals have died out (Jarchow and May 1989). Fibrous foods are fermented as they pass slowly through the hindgut, producing volatile fatty acids which are the major source of energy in herbivores (Jarchow and May 1989). Although consumption of annuals resulting from a wet spring provides a valuable nutrition source for tortoises, good quality forage is also important later in the year for activity, vitellogenesis, and spermatogenesis (Jarchow and May 1989). Spring annuals have a higher protein content than perennial grasses, however, the latter provide the tortoise with sufficient energy to prevent tissue catabolism in dry months (Jarchow and May 1989). Catabolism results from starvation or malnutrition when body tissues are used as a nutrient source. Malnutrition can lead to decreased resistance of an organism and may be a prime factor in the development of respiratory diseases in tortoises (Fowler 1977). Malnutrition results in shell deformity (Rosskopf et al. 1982) and may also account for the osteologic lesions observed in desert tortoises from the Beaver Dam Slope (Jarchow and May 1989).

Jacobson and Gaskin (1990) found that serum cholesterol of tortoises afflicted with URDS was significantly greater that of healthy tortoises. Elevated serum levels of cholesterol in ill tortoises may be a response to starvation and an attempt to meet energy needs through lipid metabolism, suggesting that habitat degradation and reduction in forage quality must be considered as a potential predisposing factor in the severity and spread of this disease (Jacobson and Gaskin, 1990). Starvation has been reported as the cause of a recent die-off in Ivanpah Valley, California (Jacobson, in prep.).

Grazing of ephemeral forage also affects reproduction, growth and survival of desert tortoises in the Mohave Desert. Tortoises must consume enough annual forage to sustain them though the summer aestivation and winter dormancy periods. The forage resulting from good rainfall years increases the number of clutches that desert tortoises produce (Turner et al. 1984) and results in increased tortoise growth (Medica et al. 1975). Increased growth is important reproductively, because larger females are able to produce larger clutch sizes (Grant 1936, Ernst and Barbour 1972).

Livestock grazing can directly impact desert tortoise populations through trampling of tortoises, sheltersites, and nest sites (Webb and Stielstra 1979, Nicholson and Humphreys 1981, Coffeen 1990). Direct mortality may also occur from equipment use during construction and maintenance of range developments, use of watering trucks, and general site inspections.

Increased public access through development of roads through grazing allotments can have negative effects on both tortoises and their habitat. Increase in human activities in an area often results in increased vandalism (including shooting and crushing by vehicles), illegal collecting, and release of captive animals (Berry 1984). The release of captive animals may lead to the continued spread of the URDS (Jacobson and Gaskin 1990).

Desert tortoise mortality, especially that of hatchlings and juveniles, can also be affected by the increased presence of ravens, which prey on small tortoises (BLM 1990). Ravens have increased in this century in combination with human developments. Range developments, especially water developments and large fence posts, may contribute to the increase of ravens on rangelands.

Livestock grazing also results in changes in habitat conditions, including decreases in shrub cover (Webb and Stielstra 1979) and desirable shrubs (Orodho et al. 1990). Shrubs and the sheltersites constructed in the loose, sandy soil that accumulates around the base of shrubs (coppice mounds) (Vasek 1989) provide important thermal cover for desert tortoises (Woodbury and Hardy 1948). Livestock can substantially reduce the effectiveness of this cover through grazing and trampling (Nicholson and Humphreys 1981). Trampling is most visible in coppice mounds, which are usually composed of loosely consolidated sands without the rainfall crusts present in intershrub soils (Webb and Stielstra 1979).

The most severe impacts to tortoises and tortoise habitat result from areas sacrificed for loading and unloading cattle, supplemental feeding, watering sites, and salt licks (Berry 1984). Not only do these activities crush tortoises, but they also result in severe degradation of habitat, soil compaction (Orodho et al. 1990) and the resultant reduction in soil moisture (Daddy et al. 1988). Grazing significantly affects the hydrology of rangelands through consumption of vegetation and trampling (Dadkah and Gifford 1980). Trampling decreases infiltration rates and increases surface runoff, leaving less water available for plant production (Dadkah and Gifford 1980). The intensity of damage to soil caused solely by cattle is assumed to be directly proportional to the AUMs of forage used per pasture (BLM 1980). The reduction in existing vegetation and the inhibition of plant production impact the desert tortoise through loss of cover and forage.

A secondary impact resulting from the introduction and spread of non-native annual grasses through overgrazing (Gould 1973) is the increase in fire frequency (Berry 1984, Schmid and Rogers 1988, BLM 1989). Perennial bunch grasses, which are not contiguous in distribution, carry a range fire poorly, in contrast to annual grasses which increase fuel and fire frequency (Schmid and Rogers 1988). Many native desert shrubs did not evolve with fire and have no particular adaptation to survive any but very low intensity fires (Vasek 1989). Intense fires and repeated burning lead to the replacement of native annual species by Mediterranean weeds (Vasek 1989). Fires also result in destruction of shrubby plant communities and the consequential loss of sites for thermal cover (Vasek 1989). Data collected by the California Desert District for the Fort Irwin Cumulative Impact Analysis show dramatic changes in the vegetative community from fires (Berry, pers. comm., October 4, 1990). The increase in fire frequency has not only negatively affected the shrub community but also causes direct mortality to desert tortoises (Berry 1984, BLM 1989).

The average fire in the Shivwits District is now around 500 acres, with the largest fire consuming 9,000 acres in 1980 (BLM 1989). Since 1975, 112.3 square miles of desert tortoise habitat have burned in the Pakoon Basin (Berry 1984). The native shrubs are not fire-resistant and on many sites have been nearly completely removed and replaced by highly competitive annuals (BLM 1989, Vasek 1989).

Numerous studies have been performed in the Southwest to measure recovery of vegetation following exclusion of grazing. Cook and Child (1971) observed that desert plants heavily clipped (90%) during any season or moderately clipped (60%) during either late spring or twice a year, in winter and again in late spring, were significantly lower in vigor than untreated plants, even after 7 year of protection (Cook and Child 1971). Bock et al. (1984) reported that a site excluded from grazing since 1968 supported 45% more grass cover, a comparatively heterogeneous grass community, and 4 times as many shrubs, compared to an adjacent continuously grazed area. After 16 years of rest, Brady et al. (1989) found increases in species diversity and significant increases in canopy cover for midgrass,

shortgrass, shrub, and forb species as compared to a grazed community. Brady et al. (1989) also found that data do not support the hypothesis that continued animal impact is necessary to prevent ecosystem deterioration.

Cumulative Effects

Cumulative effects are those effects of future non-Federal (State, local government, or private) activities that are reasonably certain to occur during the course of the Federal activity subject to consultation. Future Federal actions are subject to the consultation requirements established in Section 7 of the Act and, therefore, are not considered cumulative to the proposed action.

The majority of the land in the vicinity of the allotment is Federal land managed by the BLM. Any future activities on these lands will be subject to Section 7 consultation. Certain actions on public lands, such as unauthorized livestock use, off-road vehicle use, and dumping are difficult to control and may contribute to continued habitat loss and degradation. On-going actions on private lands, such as mining, oil and gas leases, sand and gravel operations, grazing, off-road vehicle use, and urbanization may also contribute to continued habitat loss and degradation.

INCIDENTAL TAKE

Section 9 of the Endangered Species Act, as amended, prohibits any taking (harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or attempt to engage in any such conduct) of listed species without a special exemption. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering. Under the terms of Section 7(b)(4) and 7(o)(2) of the Act, taking that is incidental to and not intended as part of the agency action is not considered taking within the bounds of the Act, provided that such taking is in compliance with this incidental take statement. The measures described below are nondiscretionary, and must be undertaken by the agency or made a binding condition of any grant or permit issued to the applicant, as appropriate.

Based on the analysis of impacts provided above, the FWS anticipates that the following take could occur as a result of the activities associated with construction of the Bighole fence in the Pakoon Springs Allotment:

1. One tortoise may be taken during construction of the fence in the form of harassment through death or removal.

2. A total of 33,568 acres of low density desert tortoise habitat and 400 acres of high density tortoise habitat may be taken as a result of management of the Pakoon Springs allotment.

Reasonable and Prudent Measures

The FWS believes that the following Reasonable and Prudent Measures are necessary and appropriate to minimize the incidental taking authorized by this Biological Opinion:

1. Adverse impacts to desert tortoises and desert tortoise habitat shall be reduced.

2. Measures shall be implemented to monitor the effects of the subject allotment on desert tortoises and their habitat.

Terms and Conditions

In order to be exempt from prohibitions of Section 9 of the Act, the BLM must ensure that the permittee complies with the following Terms and Conditions which implement the Reasonable and Prudent Measures described above.

1a. Cattle numbers shall be reduced in the Pakoon Springs allotment to a level that will use no more than 35% of the forage between November 1 and February 1.

1b. Grazing shall be restricted to the period from November 1 to February 1 in Allen Well, Pakoon Wash, Burro Springs, and Wayne's Well pastures, provided there is sufficient perennial forage available for desert tortoises. If forage is insufficient, no grazing shall occur.

1c. Grazing shall be discontinued in the Bighole pasture for 5 consecutive years, immediately following issuance of this Biological Opinion, to allow the recovery of vegetation that has been overgrazed. The BLM shall monitor change in the vegetation over the next 5 years to determine if forage has recovered sufficiently so that cattle grazing will not harm the desert tortoise.

1d. Water developments and their service areas shall be located outside of high density desert tortoise habitat. New water developments shall be located in areas that will not adversely impact tortoises or their sheltersites.

1e. All vehicle use in desert tortoise habitat shall be restricted to designated roads.

1f. All loading and unloading areas for livestock shall be located outside of high density desert tortoise habitat and in areas that will not adversely impact tortoises or their sheltersites.

1g. New and existing livestock waters in desert tortoise habitat shall be designed, constructed, and operated within one year to reduce use by tortoise predators and, thereby, avoid artificially elevating predator numbers. Livestock waters shall also be designed to reduce the incidence of tortoise drownings.

1h. A qualified biologist shall accompany all construction/maintenance activities within desert tortoise habitat to reduce impacts to tortoises, sheltersites, and habitat. The qualified biologist shall be responsible for moving tortoises out of harm's way during these activities and instructing equipment operators on how to avoid impacts.

1i. Use of non-native species for seeding shall be prohibited in desert tortoise habitat.

1j. Use of hay, protein blocks, or other supplemental feeding shall be prohibited in desert tortoise habitat to avoid the introduction of non-native plant species. Additionally, supplemental feeding indicates a lack of sufficient forage, at which time cattle should be removed from an area.

1k. The BLM shall develop, complete, and implement an allotment management plan for the Pakoon Springs allotment within 6 months of the issuance of this opinion.

2a. The BLM shall establish permanent trend monitoring sites in each existing pasture in the Pakoon Springs allotment within 6 months. Monitoring sites shall track vegetative trends, both with and without grazing. The BLM shall monitor the perennial vegetation before turning out cattle each year. The BLM shall develop monitoring plans in coordination with the FWS within 6 months of the issuance of this Biological Opinion. Monitoring plans shall include, at a minimum, trend information on perennial and annual vegetation and soil condition. The monitoring plan shall also identify species important to the tortoise, the baseline for utilization, and the magnitude and location of the sampling. Monitoring plans shall be submitted to the FWS 2 weeks prior to turning out cattle, January 1, and February 1 of each year that cattle are grazed in this allotment.

2b. When 35% utilization has been reached prior to February 1, the allottee shall have 10 days in which to remove his/her cattle from that pasture. Utilization within pastures shall not be averaged either among pastures or over time.

2c. BLM shall establish 60-day monitoring plots within the Pakoon Springs allotment to determine demographic trends (density, age-class, sex, mortality, natality) of desert tortoises. The plots shall be established within 1 year of the issuance of this Biological Opinion and read at a minimum interval of 5 years. Monitoring plot reports shall be submitted to FWS within 3 months of completion.

Reporting Requirements

Upon locating dead, injured, or sick desert tortoises, initial notification must be made to the FWS' Division of Law Enforcement, Federal Building, Room 8, 26 North McDonald, Mesa, Arizona, (Telephone: 602/261-6443). Instructions for proper handling and disposition of such specimens will be issued by the Division of Law Enforcement. Care must be taken in handling sick or injured animals to ensure proper treatment and care, and in handling dead specimens to preserve biological material in the best possible state. In conjunction with care of sick or injured tortoises, or preservation of biological materials from a dead tortoise, the BLM will ensure that photographs and information relative to the date, time, and location of the tortoise when found, and possible cause of injury or death of each tortoise are recorded and provided to the FWS.

The BLM will notify the FWS of all tortoises killed, injured, or removed from within the fence-line within three days of the completion of the construction. The BLM shall submit to the FWS a report on all tortoise-related activities undertaken due to the fence construction, including tortoise biologist activities and number of tortoises killed or injured, within 30 days after completion of fence construction.

If during the course of the action, the amount or extent of the incidental take limit is reached, the BLM must immediately reinitiate consultation with the FWS to avoid violation of Section 9 of the Act. Operations must be stopped in the interim period between the initiation and completion of the new consultation if the FWS determines that the impact of additional taking will cause an irreversible and adverse impact on the species, as required by CFR 402.14(i). The BLM should provide an explanation of the causes of the taking.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by implementing conservation programs for the benefit of endangered and threatened species. Conservation recommendations have been defined as FWS suggestions regarding discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, or regarding development of information. The recommendations provided here relate only to the proposed action and do not necessarily represent complete fulfillment of the agency's Section 7(a)(1) responsibility for these species.

1. The BLM should develop allotment management plans for all grazing allotments, placing those containing desert tortoise habitat as first priorities.

2. The BLM should obliterate and revegetate all unnecessary roads within desert tortoise habitat to reduce human disturbance.

3. The BLM should retire grazing in all high-density and category 1 desert tortoise habitats. Within the Pakoon Springs Allotment, grazing should be retired within Burro Springs pasture.

4. The BLM should develop a range-wide environmental impact statement that addresses the cumulative impacts of grazing on desert tortoises and their habitats. Information on grazing impacts should be placed on a range-wide geographical information system.

5. The BLM should provide increased ranger patrols to reduce unauthorized vehicle use within desert tortoise habitat.

Conclusion

This concludes formal consultation on Pakoon Springs Allotment. As required by 50 CFR 402.16, reinitiation of formal consultation is required if: 1) the amount or extent of incidental take is reached, 2) new information reveals effects of the agency action that may impact listed species or critical habitat in a manner or to an extent not considered in this opinion, 3) the agency action is subsequently modified in a manner that causes an effect to a listed species or critical habitat that was not considered in this opinion, and 4) a new species is listed or critical habitat designated that may be affected by the action.

As stated in your memorandum of September 6, 1990, the BLM will reinitiate consultation on the Pakoon Springs allotment upon completion of the allotment management plan. The BLM must also reinitiate consultation prior to authorization of ephemeral grazing.

The FWS appreciates the assistance and cooperation of your staff throughout this consultation process. If we can be of further assistance, please contact Sherry Barrett or me (Telephone: 602/379-4720 or FTS 261-4720).

Sam F. Spiller

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